

**NICKEL SILICIDES FORMED BY LOW-TEMPERATURE ANNEALING**  
**OF COMPOSITIONALLY MODULATED MULTILAYERS**

**Abstract of the Disclosure**

Methods are disclosed for making a compound of nickel and silicon. According to an embodiment, on a surface of a substrate (*e.g.*, silicon), multiple layer pairs are formed in a superposed manner. Each layer pair includes a respective layer of nickel and a respective layer of silicon each being 3 nm or less in thickness. The layers of nickel and silicon in the multiple layer pairs are formed in alternating order, thereby forming a multilayer structure, wherein the layers of nickel and silicon in the multilayer structure are formed at respective thicknesses corresponding to desired mole fractions of nickel and silicon in the multilayer structure. The multilayer structure is annealed at a temperature of 200 °C or less to form an amorphous alloy of nickel and silicon in the multilayer structure, wherein the alloy has the desired mole fractions of nickel and silicon. The amorphous alloy is allowed to nucleate and form a corresponding crystalline alloy having the desired mole fractions of nickel and silicon.